10th Class 2021		
Chemistry	Group-I	Paper-II
Time: 1.45 Hours	(Subjective Type)	Marks: 48

(Part-I)

2. Write short answers to any FIVE (5) questions: (10)

(i) Write any two macroscopic properties of reverse reaction.

Ans The two characteristics of reverse reaction are:

1. It is a reaction in which products react to produce reactants.
2. It takes place from right to left.

(ii) Write the equilibrium constant expression for the following reaction:

$$2NO_{2(g)} \rightleftharpoons N_2O_{4(g)}$$

Ans The equilibrium constant expression for this reaction is:

$$K_c = \frac{[N_2O_4]}{[NO_2]^2}$$

(iii) Define chemical equilibrium state.

Ans When the rate of forward reaction takes place at the rate of reverse reaction, the composition of the reaction mixture remains constant, it is called a chemical equilibrium state.

(iv) What are limitations of Arrhenius concept?

Ans **Limitations of Arrhenius Concept:**

1. This concept is applicable only in aqueous medium and does not explain nature of acids and bases in non-aqueous medium.
2. According to this concept, acids and bases are only those compounds which contain hydrogen (H^+) and hydroxyl (OH^-) ions, respectively. It can't explain

the nature of compounds like CO_2, NH_3, etc. which are acid and base, respectively.

(v) Write two uses of aluminium hydroxide.

Ans The uses of aluminium hydroxide $Al(OH)_3$ are as follows:

1. It is used as foaming agent in fire extinguishers.
2. It is used for the relief of sour stomach.

(vi) Write the name and formula of any two naturally occurring acids.

Ans The naturally occurring acids are as follows:

1. Formic acid, HCOOH.
   Source: Stings of bees & wasps.
2. Butyric acid, $H_3C - CH_2 - CH_2 - COOH$.
   Source: Rancid butter.

(vii) How is carboxylic group tested?

Ans **Test for Carboyxl Group** $-\overset{\overset{O}{\|}}{C}-OH$

(i) Litmus test:

Shake a pinch of the given compound with water and add a drop of blue litmus solution.

Result:

Litmus paper will turn red.

(ii) $NaHCO_3$ solution test:

Take about 2.0 cm^3 of 5% $NaHCO_3$ solution and add a pinch of given compound.

Result:

CO_2 gas with effervescence evolves.

(viii) Write two uses of acetic acid.

Ans The uses of acetic acid are as follows:

1. It is used for flavouring food and food preservation.
2. It is used to cure the sting of wasps.

3. Write short answers to any FIVE (5) questions: (10)

(i) Give two sources of alkanes.

Ans Following are the two sources of alkanes:

1. The main sources of alkanes are petroleum and natural gas.
2. Methane forms about 85% of natural gas.

(ii) Give two physical properties of alkynes.

Ans Following are the two physical properties of alkynes:

1. Alkynes also form a series of compounds. Its first member is acetylene. It is a colourless gas with faint garlic odour.
2. Acetylene is slightly soluble in water but soluble in organic solvents such as benzene, alcohol, acetone, ether, etc.

(iii) What do you know about hydrogenation of alkenes?

Ans **Hydrogenation of Alkenes:**

Hydrogenation means addition of molecular hydrogen to an unsaturated hydrocarbon in the presence of a catalyst (Ni, Pt) to form saturated compound.

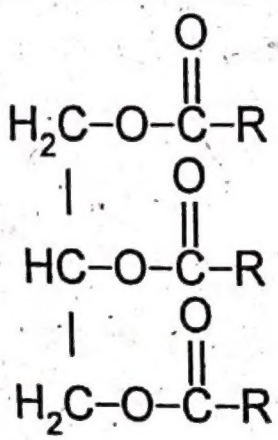
$$H_2C = CH_2 + H_2 \xrightarrow[250-300^\circ C]{Ni} H_3C - CH_3$$

On industrial scale, this reaction is used to convert vegetable oil into margarine (Banaspati ghee).

$$\text{Oil} + H_2 \xrightarrow{Ni} \text{Margarine (Banaspati ghee)}$$

(iv) Give general formula of triglyceride.

Ans General formula of triglycerides is as under:



(v) Give name and formula of a fatty acid.

Ans Palmitic acid is a fatty acid. Its formula is $C_{15}H_{31}COOH$.

(vi) Define greenhouse effect.

Ans CO_2 in the atmosphere acts like a glass wall of a greenhouse. It allows UV radiations to pass through it but does not allow the IR radiations to pass through it. It traps some of the infrared radiations emitted by the Earth. Hence, increased concentration of CO_2 layer absorbs the infrared radiations emitted by the Earth's surface that prevents heat energy escaping from the atmosphere. It helps to stop surface from cooling down during night. As the concentration of CO_2 in air increases, less heat energy is lost from the surface of the Earth. Therefore, the average temperature of the surface gradually increases. This is called greenhouse effect. This effect is proportional to amount of CO_2 in air.

(vii) Give two effects of acid rain.

Ans Two effects of acid rain are:

(i) Acid rain on soil and rocks leaches heavy metals (Al, Hg, Pb, Cr, etc.) with it and discharges these metals into rivers and lakes. This water is used by human beings for drinking purpose. These metals accumulate in human body to a toxic level. On the other hand, aquatic life present in lakes also suffers because of high concentration of these metals. Especially high concentration of aluminium ions clogs the fish gills. It causes suffocation and ultimately death of fish.

(ii) Acid rain attacks the calcium carbonate present in the marble and limestone of buildings and monuments. Thus, these buildings are getting dull and eroded day by day.

(viii) How acid rain is produced?

Ans Acid rain is produced on dissolving acidic air pollutants such as sulphur dioxide and nitrogen dioxide by rainwater.

4. Write short answers to any FIVE (5) questions: (10)

(i) Water is a universal solvent. Give an example.

Ans Water is the universal solvent because it can dissolve almost all the minerals.

Its ability to dissolve substances is because of two unique properties of water:

1. polarity of water molecule;
2. exceptional hydrogen bonding ability.

(ii) What are soft and hard water?

Ans **Soft water:**

Soft water is that which produces good lather with soap.

Hard water:

Hard water is that which does not produce lather with soap.

(iii) How detergents make the water unfit for aquatic life?

Ans Because the detergents are non-biodegradable, so they remains in the water for a long time and makes the water unfit for aquatic life. The phosphate salts present in detergents cause rapid growth of algae in water bodies, which floats over the surface of water. These plants ultimately die and decay. Decaying plants being biodegradable consumes O_2 present in water. Thus, depletion of O_2 results in death of aquatic life.

(iv) Write a brief note on cholera.

Ans Cholera is an acute infection caused by the bacteria Vibrios cholerae, which may be found in water contaminated by human feaces. Cholera causes severe diarrhoea and can be fatal.

(v) Define: (i) Gangue (ii) Metallurgy

Ans **(i) Gangue:**

The earthly and other impurities associated with the minerals are known as gangue.

(ii) Metallurgy:

The process of extraction of metal in pure state on a large-scale from its ore by physical or chemical means is called as metallurgy.

(vi) What is gravity separation?

Ans **Gravity separation:**

Gravity separation is based on the differences in densities of the metallic ore and the gangue particles.

In process, the powdered heavy metal bearing ore settles down on agitation in a stream of water, while the lighter gangue particles are carried away by the water.

(vii) Give raw materials for preparation of urea.

Ans The raw materials for the manufacturing of urea are:

(i) Ammonia (NH_3) (ii) Carbon dioxide (CO_2)

Ammonia is prepared by the "Haber's process". One volume of nitrogen (from air) and three volumes of hydrogen (obtained by passing methane and steam over heated nickel catalyst) is passed over iron catalyst at 450°C and 200 atm pressure.

$$N_{2(g)} + 3H_{2(g)} \underset{200\ atm}{\overset{450^{\circ}C}{\rightleftharpoons}} 2NH_{3(g)}$$

(viii) How roasting is carried out?

Ans **Roasting:**

It is a process of heating the concentrated ore to a high temperature in excess of air. For example: copper pyrite ($CuFeS_2$) is strongly heated in excess of air to convert it into a mixture of cuprous sulphide and ferrous sulphide ($Cu_2S + FeS$). While impurities react with oxygen to form volatile oxides. Such as

$$2CuFeS_{2(s)} + O_{2(g)} \longrightarrow Cu_2S_{(s)} + 2FeS_{(s)} + SO_{2(g)}$$

(Part-II)

NOTE: Attempt any TWO (2) questions.

Q.5.(a) Write down five methods for the preparation of salts. (5)

Ans There are five general methods for the preparation of salts. Four methods make soluble salts but one prepares insoluble salts.

(i) Preparation of soluble salts:

Soluble salts are often prepared in water. Therefore, they are recovered by evaporation or crystallization.

(a) By the reaction of an acid and a metal: (Direct Displacement method)

This is direct displacement method in which hydrogen ion of acid is replaced by a reactive metal. Such as calcium, magnesium, zinc and iron, *e.g.*,

$$\text{Acid} + \text{Metal} \longrightarrow \text{Salt} + \text{Hydrogen gas}$$

$$2HCl_{(aq)} + Mg_{(s)} \longrightarrow MgCl_{2(aq)} + H_{2(g)}$$

(b) By the reaction of an acid and a base: (Neutralization method)

It is a neutralization reaction in which acid and base react to produce a salt and water.

$$\text{Acid} + \text{Base} \longrightarrow \text{Salt} + \text{Water}$$

$$HCl_{(aq)} + NaOH_{(aq)} \longrightarrow NaCl_{(aq)} + H_2O_{(l)}$$

(c) By the reaction of an acid and metallic oxide:

Mostly the insoluble metallic oxides react with dilute acids to form salt and water.

$$\text{Acid} + \text{Metallic oxid} \longrightarrow \text{Salt} + \text{Water}$$

$$H_2SO_{4(aq)} + CuO_{(aq)} \longrightarrow CuSO_{4(aq)} + H_2O_{(aq)}$$

(d) By the reaction of an acid and a carbonate:

Dilute acids react with metallic carbonates to produce salts, water and carbon dioxide gas.

$$2HNO_{3(aq)} + Na_2CO_{3(aq)} \longrightarrow 2NaNO_{3(aq)} + H_2O_{(l)} + CO_{2(g)}$$

(ii) Preparation of insoluble salts:

In this method, usually solutions of soluble salts are mixed. During the reaction, exchange of ionic radicals (*i.e.*, metallic radicals exchange with acidic radicals) takes place to produce two new salts. One of the salts is insoluble and the other is soluble. The insoluble salt precipitates (solidify in solution).

$$AgNO_{3(aq)} + NaCl_{(aq)} \longrightarrow AgCl_{(s)} + NaNO_{3(aq)}$$

$$Na_2CO_{3(aq)} + CuSO_{4(aq)} \longrightarrow CuSO_{3(s)} + Na_2SO_{4(aq)}$$

(b) Write a note on halogenation of alkanes. (4)

Ans **Halogenation:**

Alkanes give only substitution reactions. A reaction in which one or more hydrogen atoms of a saturated compound are replaced with some other atoms (like halogen) is called a substitution reaction. These reactions are a characteristic property of alkanes. Alkanes react fairly with halogens in diffused sunlight only. In dark, there is no reaction. In direct sunlight, reaction is explosive and carbon is deposited.

$$CH_4 + 2Cl_2 \xrightarrow{\text{bright sunlight}} C + 4HCl$$

In diffused sunlight, a series of reactions take place and at each step one hydrogen atom is substituted by halogen atoms, so that all the hydrogen atoms are substituted one by one by halogen atoms

$$CH_4 + Cl_2 \xrightarrow[\text{sunlight}]{\text{diffused}} CH_3Cl + HCl$$

Chloromethane

$$CH_3Cl + Cl_2 \xrightarrow{\text{sunlight}} CH_2Cl_2 + HCl$$

Dichloromethane

$$CH_2Cl_2 + Cl_2 \xrightarrow{\text{sunlight}} CHCl_3 + HCl$$

Trichloromethane (Chloroform)

$$CHCl_3 + Cl_2 \xrightarrow{\text{sunlight}} CCl_4 + HCl$$

Tetrachloromethane
(Carbon tetrachloride)

Q.6.(a) Write down the characteristics of homologous series. (5)

Ans Homologous Series:

Organic compounds are divided into groups of compounds having similar chemical properties. Each group is known as a homologous series. Organic compounds of the same homologous series have the following properties in common:

(i) All members of a series can be represented by a general formula. For example: general formulae of alkanes, alkenes and alkynes are C_nH_{2n+2}, C_nH_{2n} and C_nH_{2n-2}, respectively.

(ii) Successive members of the series differ by one unit of $-CH_2-$ and 14 units in their relative molecular mass.

(iii) They have similar chemical properties (because they contain the same functional group).

(iv) There is a regular change in their physical properties; the melting and boiling points increase gradually with the increase of molecular masses.

(v) They can be prepared by similar general methods.

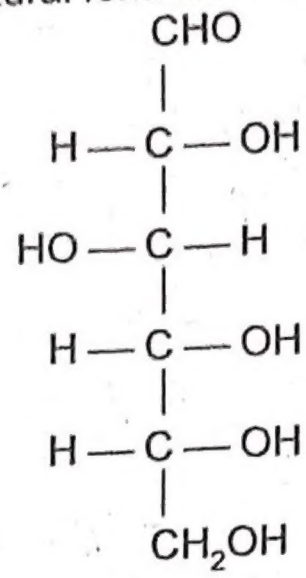
Hydrocarbons are regarded as parent organic compounds. All other compounds are considered to be derived from them by substituting one or more hydrogen atoms of a hydrocarbon by one or more reactive atom or group of atoms.

(b) Write four properties of monosaccharides. (4)

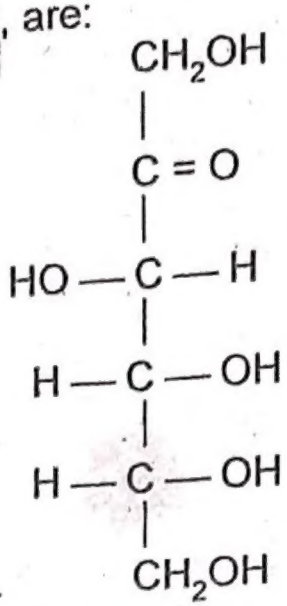
Ans Monosaccharides:

Monosaccharides are the simplest sugars which cannot be hydrolyzed. They consist of 3 to 9 carbon atoms. Therefore, they are classified according to the number of carbon atoms in their molecules as trioses, tetroses, pentoses, hexoses, and so on. The preparation

of important monosaccharides are given as follows. The structural formulas of them, are:



(Glucose)



Fructose

Characteristics:

Following are the characteristics of Monosaccharides:

1. Monosaccharides are white crystalline solids.
2. They are soluble in water and have sweet taste.
3. They cannot be hydrolyzed.
4. They are reducing in nature, therefore, these are called reducing sugars.

Q.7.(a) Where does ozone layer lie in atmosphere? How it is depleting and how can we prevent its depletion? (5)

Ans Ozone Depletion and Its Effects:

Ozone is an allotropic form of oxygen consisting of three oxygen atoms. It is formed in atmosphere by the association of an oxygen atom with an oxygen molecule in the mid of stratosphere.

$$O_{(g)} + O_{2(g)} \longrightarrow O_{3(g)}$$

Ozone is present throughout the atmosphere. But its maximum concentration called zone layer lies in

stratosphere region about 25 to 30 km away from the Earth's surface. This layer surrounds the globe and protects Earth like a shield from harmful ultraviolet radiations of sunlight as shown in figure. Otherwise, ultraviolet radiations would cause skin cancer. Thus ozone layer in stratosphere is beneficial for life on the Earth.

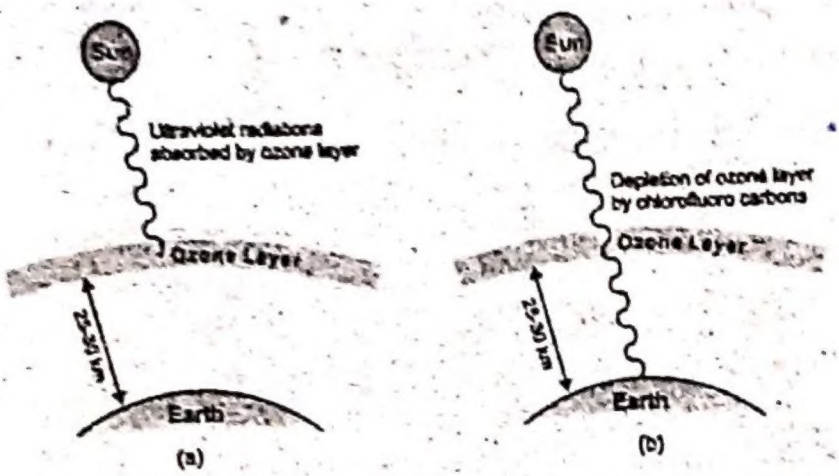


Fig. (a) Ozone layer, (b) Depletion of ozone layer.

Under normal conditions, ozone concentration in stratosphere remains nearly constant through a series of complex atmospheric reactions. Two reactions that maintain a balance in ozone concentrations are as follows:

$$O_{2(g)} + O_{(g)} \longrightarrow O_{3(g)} \text{ (formation)}$$

$$O_{3(g)} + O_{(g)} \longrightarrow 2O_{2(g)} \text{ (decomposition)}$$

But this ozone layer is being depleted through various chemical reactions.

However, chlorofluorocarbons (CFCs) (used as refrigerants in air-conditioners and refrigerators) are major cause of depletion of ozone layer. These compounds leak in one way or other escape and diffuse to stratosphere. Ultraviolet radiations break the C-Cl bond in $CFCl_3$ and generates chlorine free radicals as

$$CFCl_3 \xrightarrow{UV} CFCl_2 + Cl^{\bullet}$$

These free radicals are very reactive. They react with ozone to form oxygen as

$$O_{3(g)} + Cl^{\bullet} \longrightarrow O_{2(g)} + OCl^{\bullet}$$

$$OCl^{\bullet} \longrightarrow O^{\bullet} + Cl^{\bullet}$$

$$O^{\bullet} + O^{\bullet} \longrightarrow O_{2(g)}$$

A single chlorine-free radical released by the decomposition of CFCs is capable of destroying up to many lacs of ozone molecules. The region in which ozone layer depletes is called ozone hole.

(b) How polarity of water molecule plays its role to dissolve the substances? (4)

Ans **Polar nature of water:**

Water molecule has polar structure, *i.e.*, one end of the molecule is partially positive while the other end is partially negative because of electronegativity difference between oxygen and hydrogen atoms.

All other polar substances are soluble in water, because the positive end of the substance is attracted by the negative end ($O^{\delta-}$) of the water and negative end of the substance is attracted by the positive end ($H^{\delta+}$) of the water. The electrostatic attractions among the ions are overcome by the ion-dipole forces of attraction between ion and water molecules. In this way, positive and negative ions of the compounds are pulled apart as shown in figure. Ultimately, these oppositely charged ions are surrounded by water molecules, thus separated and kept in solution. For example, most of the salts like NaCl, KCl, Na_2SO_4, etc. are soluble in water.

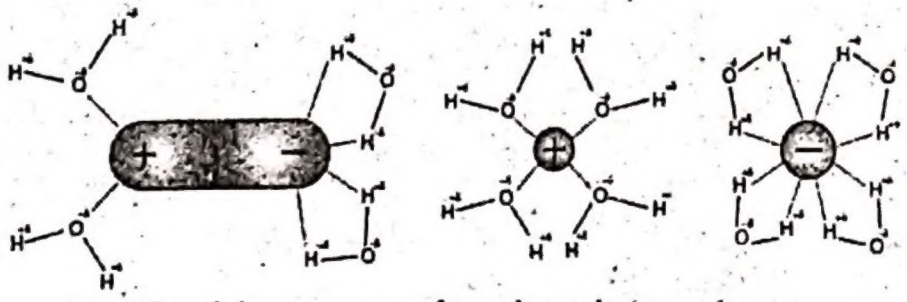


Fig. Dissolving process of a polar substance in water.

On the other hand, many covalent substances like benzene, ether, octane, etc., which do not have polar ends or bonds are not attracted by water molecules. Therefore, non-polar compounds do not dissolve in water.